

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**



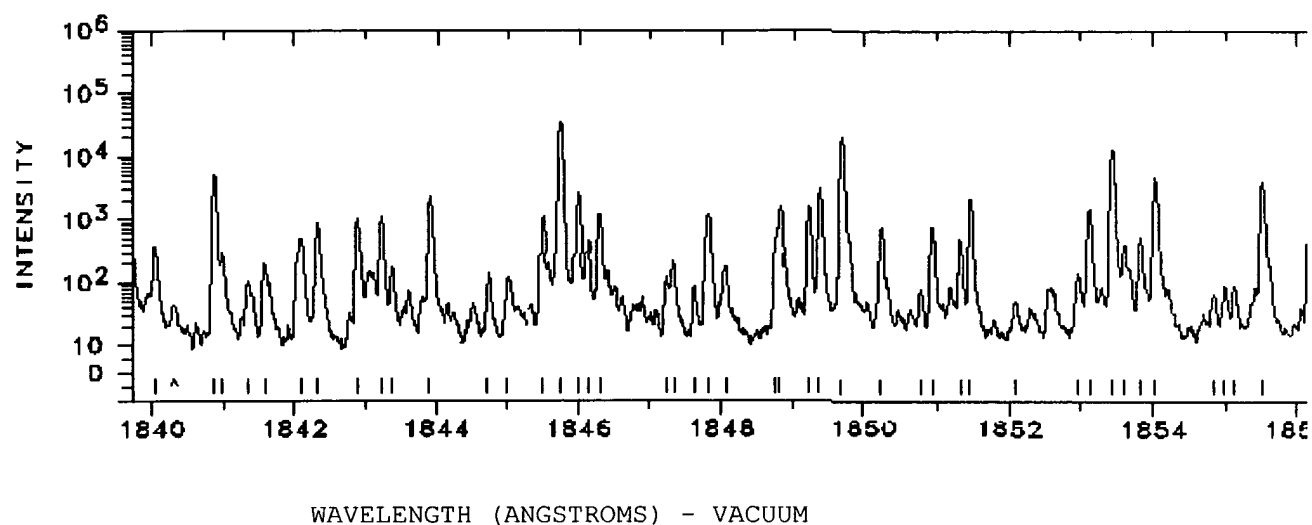
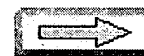
Lines and intensities in the range 1840-1856 Å.

WAVELENGTH	WAVENUMBER	INTENSITY	CLASSIFICATION	CODE
1840.05	54346.3	350		
1840.8825	54321.772	5200	Pt II	29030- 83352 14
1840.99	54318.6	280		
1841.35	54308.0	100	Ne III	L
1841.60	54300.6	190	Ne III	L
1842.10	54285.9	500	Pt II	32918- 87204 AK
1842.10	54285.9	500	Ne III	AL
1842.3413	54278.76	880	Ne II	C
1842.8889	54262.631	970	Pt II	36484- 90746 K
1843.2224	54252.813	1100	Pt II	32237- 86489 K
1843.38	54248.2	160		
1843.9105	54232.57	2300	Ne II	C
1844.73	54208.5	130		
1845.00	54200.5	120		
1845.5046	54185.722	1100	Pt I	823- 55009 N
1845.7517	54178.468	34000	Pt I	0- 54178 N
1845.9968	54171.28	2600	Ne II	C
1846.14	54167.1	450		
1846.3115	54162.041	1200	Pt II	15791- 69953 04
1847.2454	54134.66	110	Ne II	C
1847.34	54131.9	200	Pt I	10116- 64248 N
1847.64	54123.1	74	Pt II	41434- 95557 K
1847.8453	54117.084	1300	Pt I	10131- 64248 N
1848.07	54110.5	170	Ne III	L
1848.7609	54090.284	400	Pt II	29261- 83352 14
1848.8229	54088.47	1300	Ne II	C
1849.2224	54076.784	1700	Pt II	23461- 77538 K
1849.3784	54072.22	3200	Ne II	C
1849.6831	54063.314	20000	Pt I	775- 54839 D
1850.2332	54047.241	770		
1850.77	54031.6	70		
1850.9260	54027.012	750	Pt II	24879- 78906 10
1851.3195	54015.528	480	Pt I	823- 54839 D
1851.4696	54011.150	2200	Pt I	0- 54011 D
1852.09	53993.1	45	Ne III	L
1852.96	53967.7	130	Ne III	L
1853.1147	53963.20	1500	Ne II	C
1853.4523	53953.373	14000	Pt I	0- 53953 A
1853.4523	53953.373	14000	Pt II	114861- 60907 K
1853.61	53948.8	400	Pt II	54373-108322 K
1853.83	53942.4	530	Pt II	34647- 88589 K
1854.0403	53936.26	4600	Ne II	C
1854.84	53913.0	60	Ne III	L
1854.99	53908.6	84		
1855.12	53904.9	81		

1855.5230 53893.161 4000 Pt II 43737- 97630 K

Character descriptor definitions (appear to right of intensity)Code definitions

Photoelectric spectrum

A PostScript file is available.



SCIENCE DIRECT

[Register](#) or Login: user name

Password:

[Athens](#)[Home](#)[Journals](#)[Abstract Databases](#)[Reference Works](#)[My Alerts](#)[My Profile](#) [Help](#)WELCOME GUEST USER [info](#)[return to SCIRUS](#)[Surface Science](#)

Volume 119, Issues 2-3, 2 July 1982, Pages 184-206

doi:10.1016/0039-6028(82)90292-8 Cite or link using doi
 Copyright © 1982 Published by Elsevier Science B.V. All rights reserved.

This Document

► **Abstract**

- [Abstract + References](#)
- [PDF \(1244 K\)](#)

Actions

- [E-mail Article](#)

The kinetics and mechanism of the hydrogen-oxygen reaction on Pt(S)-[9(111) × (100)]

G. E. Gdowski and R. J. Madix

Department of Chemical Engineering, Stanford University, Stanford, California 94305, USA

Received 17 December 1981; accepted 7 April 1982. Available online 19 September 2002.

Abstract

Modulated molecular beam experiments were performed to study the reduction of chemisorbed oxygen by hydrogen on Pt(S)-[9(111) × (100)] in the temperature range 400 to 1000 K. At temperatures below 700 K water was formed via a process with an apparent second order dependence on adsorbed hydrogen atoms. This dependence was believed to be due to short surface lifetimes of hydroxyl species. The process showed an activation energy of 20.8 kcal/mol. Consideration of the reaction energetics suggests this value is a composite of the equilibrium between adsorbed oxygen atoms, hydrogen atoms, and OH and the reaction between H_(a) and OH_(a) to form H₂O. At higher temperatures above 700 K a parallel process for water formation appeared. This process was associated with the strongly held oxygen atoms at the step sites.

[Surface Science](#)

Volume 119, Issues 2-3, 2 July 1982, Pages 184-206

This Document

► **Abstract**

- [Abstract + References](#)
- [PDF \(1244 K\)](#)

Actions

- [E-mail Article](#)



SCIENCE DIRECT

Register or Login: user name

Password:

[Athe](#)[Home](#)[Journals](#)[Abstract Databases](#)[Reference Works](#)[My Alerts](#)[My Profile](#) [Help](#)

WELCOME GUEST USER

[return to SCIRUS](#)[Surface Science](#)

Volume 166, Issues 2-3 , 2 February 1986, Pages 283-300

doi:10.1016/0039-6028(86)90680-1 Cite or link using doi
Copyright © 1986 Published by Elsevier Science B.V. All rights reserved.

This Document

► **Abstract**

- [Abstract + References](#)
- [PDF \(1047 K\)](#)

Actions

- [E-mail Article](#)

Water formation on Pt(111): Reaction of an intermediate with H₂(g)^{*1}

Gary E. Mitchell, Sohail Akhter and J. M. White

Department of Chemistry, University of Texas, Austin, Texas 78712, USA

Received 16 July 1985; accepted 30 September 1985. Available online 26 September 2002.

Abstract

The formation of water from an intermediate, I, and H₂ on Pt(111) has been studied using static secondary ion mass spectrometry (SSIMS) at temperatures where the product water remains adsorbed (< 160 K). The intermediate was prepared by the reaction of various amounts of preadsorbed H₂O with 0.25 monolayer (ML) of chemisorbed oxygen atoms, O(a). The reaction of H₂ with I, and remaining unreacted O(a), to form H₂O was followed by the time dependence of the SIMS H₃O⁺ signal. As the concentration of I increases, the amount of unreacted O(a) decreases and the typically observed induction time decreases. The latter drops to zero when sufficient H₂O (0.5 ML) is added to completely convert all the O(a) (0.25 ML) into I. We propose a structure for this intermediate and use it in a mechanism for the reaction H₂(g)+O(a)→H₂O(a) on Pt(111) that is consistent with available experimental evidence. The mechanism involves formation of I ("induction period") and its reaction with hydrogen to form water ("rapid reaction").

^{*1} Supported in part by the National Science Foundation, CHE 8505413, and the Robert A. Welch Foundation.

[Surface Science](#)

Volume 166, Issues 2-3 , 2 February 1986 , Pages 283-300

This Document

► **Abstract**



SCIENCE DIRECT

Register or Login: user name

Password:

Athel

[Home](#)[Journals](#)[Abstract Databases](#)[Reference Works](#)[My Alerts](#)[My Profile](#)

Help

WELCOME GUEST USER

[return to SCIRUS](#)[Chemical Physics Letters](#)

Volume 135, Issues 1-2 , 27 March 1987, Pages 84-88

doi:10.1016/0009-2614(87)87221-4 Cite or link using doi

Copyright © 1987 Published by Elsevier Science B.V. All rights reserved.

Identification of the intermediate in the water formation reaction on Pt(111)

G. E. Mitchell and J. M. White

Department of Chemistry, University of Texas at Austin, Austin, TX 78712, USA

Received 12 December 1986; accepted 12 January 1987. Available online 2 November 2001.

Abstract

Adsorbed hydroxyl (OH(a)) has been identified by HREELS as an intermediate in the reaction of $\text{H}_2(\text{g}) + \text{O}(\text{a}) \longrightarrow \text{H}_2\text{O}(\text{a})$ on Pt(111). This OH(a) is different from the product of the reaction of water with adsorbed oxygen atoms which also occurs on Pt(111). Adsorbed water made by reaction of $\text{H}_2(\text{g}) + \text{O}(\text{a})$ has a HREEL spectrum different from that of water adsorbed from gas phase H_2O and this is explained in terms of a difference in binding geometry for the two cases. Reaction generated water does not readily tilt to form hydrogen bonds.

[Chemical Physics Letters](#)

Volume 135, Issues 1-2 , 27 March 1987 , Pages 84-88

This Document

► **Abstract**

- [Abstract + References](#)
- [PDF \(428 K\)](#)

Actions

- [E-mail Article](#)

[Home](#)[Journals](#)[Abstract Databases](#)[Reference Works](#)[My Alerts](#)[My Profile](#)

Help

Send [feedback](#) to ScienceDirect



SCIENCE DIRECT

Register or Login: user name

Password:

[Athe](#)[Home](#)[Journals](#)[Abstract Databases](#)[Reference Works](#)[My Alerts](#)[My Profil](#) [Help](#)WELCOME GUEST USER [info](#)[return to SCIRUS](#)[Surface Science](#)

Volume 324, Issues 2-3, 10 February 1995, Pages 185-201

doi:10.1016/0039-6028(94)00697-0 Cite or link using doi

This Document

► **Abstract**• [PDF \(1351 K\)](#)

Actions

• [E-mail Article](#)

Hydrogen adsorption on oxygen covered Pt(111)

L. K. Verheij^{a,*} and M. B. Hugenschmidt^{b, a}^a Institut für Grenzflächenforschung und Vakuumphysik, Forschungszentrum Jülich GmbH, Postfach 1913 D-52428 Jülich Germany^b Universität Ulm, Abteilung Oberflächenchemie und Katalyse D-89069 Ulm Germany

Received 9 February 1994; accepted 7 October 1994. Available online 17 February 2000.

Abstract

Adsorption of hydrogen on oxygen covered Pt(111) is investigated in the temperature range 300-600 K by titration of adsorbed atomic oxygen with hydrogen from a supersonic beam. In most experiments the conditions were such that hydrogen adsorption was rate limiting for oxygen coverages larger than 10% of the saturation coverage. In that case, the hydrogen sticking probability is equal to the water formation rate per incident molecule. Activated and non-activated adsorption are observed. The two processes show qualitatively different dependences on oxygen coverage. The probability for non-activated adsorption does not depend on the coverage of disordered oxygen, but it increases with increasing order (on a scale of 2-4 atoms) of the adsorbed oxygen layer. The probability for activated adsorption decreases with oxygen coverage and is not sensitive to the order of the oxygen layer. Atomic steps change, above all, the adsorption characteristics at low coverages. We can exclude that steps are involved in the non-activated process. Under the experimental conditions in which hydrogen accumulates on the surface to a non-negligible coverage, we observe a phase separation between the hydrogen and oxygen, indicating a decreased binding energy of H atoms inside O islands on the surface.

Author Keywords: Adsorption kinetics; Atom-solid scattering and diffraction - elastic; Hydrogen; Low index single crystal surfaces; Oxygen; Platinum

*Corresponding author.



SCIENCE DIRECT

Register or Login: user name

Password:

Athens

[Home](#)[Journals](#)[Abstract Databases](#)[Reference Works](#)[My Alerts](#)[My Profile](#) [Help](#)WELCOME GUEST USER [Info](#)[return to SCIRUS](#)[Surface Science](#)

Volume 371, Issue 1, 20 January 1997, Pages 100-110

doi:10.1016/S0039-6028(96)00976-4 Cite or link using doi
Copyright © 1997 Published by Elsevier Science B.V.

This Document

► **Abstract**

- Abstract + References
- PDF (846 K)

[Surface science](#)

Actions

- [E-mail Article](#)

Kinetic modelling of the hydrogen-oxygen reaction on Pt(111) at low temperature (< 170 K)

Laurens K. Verheij

Institut für Grenzflächenforschung und Vakuumphysik, KFA-Forschungszentrum Jülich, Postfach 1913, D-52425, Jülich, Germany

Received 31 May 1996; accepted 22 July 1996. ; Available online 13 May 1998.

Abstract

Recently a kinetic model was proposed for describing the hydrogen-oxygen reaction on Pt (111). This model is based on the reactive-site mechanism, i.e. only a very limited number of Pt sites are considered to be catalytically active for the actual water formation reaction. Here we consider the implications of the model for the H_2 --- O_2 reaction at low temperatures (< 300 K) in more detail. Additional autocatalytic reaction steps between oxygen, H_2O and reaction intermediates are taken into account which enable the complete conversion of oxygen to H_2O . The model is consistent with the observed transition from a reaction mechanism through which H_2O can be formed at temperatures as low as 130 K to the much slower diffusion-controlled mechanism which was found to dominate at low oxygen coverages at higher temperatures (> 250–300 K). Using the same reaction parameters, data sets of Ogle et al. and Germer et al. can be simulated quite well with the model. The actual water-formation reaction (at the reactive site), the reaction between H_2O and O atoms (at the "reaction front") and the adsorption of hydrogen appear to be the rate-limiting steps. The simulations indicate that the adsorption of hydrogen proceeds via a rather complex process, which is difficult to incorporate correctly in the model.

Author Keywords: Hydrogen; Low index single crystal surfaces; Models of surface kinetics; Oxygen; Platinum; Surface chemical reaction